REMARKS

In view of the following remarks, the Examiner is requested to withdraw the rejections and allow Claims 13-16, 18, 19, 22, 23, 30, 23-39, 42-46, and 52-71; the only claims pending and currently under examination in this application.

Formal Matters

Claims 30 and 62-66 have been amended to make minor corrections of format. Independent Claim 40 has been cancelled without prejudice. Claims 33-36 and 57-61 have been amended to be dependent or subdependent on new Claim 67. Independent Claim 42 has been amended, and new independent Claims 67 and 70 have been added. Support for the amendment to Claim 42 and for Claim 67 and 70 can be found throughout the instant application, for example in paragraphs 62-74, and 98-100. Claim 68 has been added as a dependent claim to new Claim 67, and support for Claim 68 can be found throughout the application, for example in paragraph 43. Claim 69 has been added as a dependent claim to new Claim 67, and support for Claim 69 can be found throughout the application, for example in paragraph 51. Finally, new independent Claim 70 has been added, and support for Claim 70 can be found throughout the application, for example in paragraphs 62-74, 67, 68, and 98-100. Accordingly, no new matter has been added.

Claim Rejections –35 U.S.C. § 102(e)

In the Office Action, Claim 40 was rejected as being anticipated by Korgel, US 6,918,946. Claim 40 has been cancelled without prejudice. For this reason, the Applicant respectfully requests that this rejection be withdrawn.

Claim Rejections –35 U.S.C. § 103(a)

In the Office Action dated May 4, 2006, Claims 13-16, 19, 22, 23, 30, 32-34, 36, 38, 42-46, and 52-66 were rejected under 35 USC 103(a) as being unpatentable over Mikhael, US 2003/0080677 (hereafter '677) in view of Korgel, US 6,918,946 (hereafter '946).

In making the rejection, the Examiner asserted that '677 discloses a light-emitting device, comprising a substrate, and a planar light emitting subassembly, but that '677 does not disclose the subassembly comprising light-emitting group IV nanoparticles. The Examiner further asserts that since '946 discloses a light-emitting device comprising light-

emitting group IV nanoparticles, that it would have been obvious to one of ordinary skill in the art at the time to combine the teachings of '677 and '946 to arrive at the embodiments of light-emitting devices and fabrication methods of the instant application.

The three basic criteria that must be met to establish a *prima facie* case of obviousness are set forth in M.P.E.P. 2143:

> To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 U.S.P.Q. 2d 1438 (Fed. Cir. 1991).

As will be set forth below, the Applicants respectfully submit that the Examiner's *prima facie* case of obviousness is deficient, as neither the teaching nor suggestion to of the light-emitting devices and fabrication methods of the instant application nor a reasonable expectation of success of such devices and fabrication methods can be found in the either '677 or '946, or the combination of the references.

By way of a brief overview of the instant application, Group IV nanostructures are new materials, having unique properties, many of which are suited for lighting applications (see paragraphs 48, 61). Additionally, given the size range of interest; between about 0.5 nm to about to about 100 nm, these materials having unique properties are also colloids. As one of ordinary skill in the art of colloid science is apprized, colloid behavior is highly material dependent. As such, formulation of stable dispersions, or inks is given in the instant applicaion. Once such dispersions are enabled, they in turn enable the deposition of such materials on large areas (see paragraphs 67-72).

In reference '677, a method for correcting defects in large-area photonic polymer films is taught. In the Office Action, specific reference to Fig. 2 of '677 is indicated. In Fig. 2 of '677, an 8 layer organic light-emitting diode (OLED) device is shown and described in paragraph 26. Specifically, for the active, light-emitting layers, the description given is (underline added for emphasis):

"A composite matrix **48** of organic electron-donor molecules embedded in a polymer is deposited over the anode **42**, followed by another composite matrix **50** of organic electron-acceptor molecules incorporated into the same or another polymeric material."

Clearly, '677 teaches the use of large-area photonic films using organic donor/acceptor molecules in a polymeric matrix. Additionally, since the donor/acceptor materials used in an OLED are organic molecules, they are amenable to processing procedures in which they are readily soluble, and easily dispensed. As such, there is no teaching or suggestion in '677 for devices and fabrication methods for large area light-emitting films using colloidal Group IV semiconductor nanostructures, such as embodiments of the large-area light-emitting films of the instant application. Additionally, there is no teaching in '677 that would lead one of ordinary skill in the art to a reasonable expectation of success for devices and fabrication methods, such as of the embodiments of devices and fabrication methods of the instant application.

In order to make up the deficiency of '677 in teaching or suggesting embodiments of instant application, the Examiner cites '946. Specifically, in '946, Fig. 5 is referred to in the Office Action. In Fig. 5, a 4 layer device is depicted, in which a monolayer of nanoparticles is shown for active layer **58**.

As previously mentioned, colloidal Group IV nanostructures are new materials, having unique properties (see instant application; paragraph 48). Such new materials present interesting challenges to those on the frontier of working with such materials, and therefore lead to differences in understanding of the types of devices and fabrication methods for which the materials are well-suited. This is captured in the contrast between the teachings of '946 and that of the instant application. For example, in '946, column 23, lines 64-67, the teaching of the use of a polymeric matrix is given in '946 as (underline added for emphasis):

"However, nanoparticle based light emitting device **52** may not require a polymer to emit, in contrast to many organic LEDs. Polymers may inflict losses through absorption, scattering, and poor electron-hole interfaces."

The teaching of polymers as not desirable for use in combination with Group IV nanostructures is opposite to the teaching of the instant application, which teaches the

use of polymers as suitable matrix materials in light-emitting devices (see paragraphs 65-67). In that regard, '946 teaches away from embodiments of devices and fabrication methods of the instant application, since as one of ordinary skill in the art is aware, losses of light incurred through absorption and scattering are contraindicated for use in a light-emitting device. As such, '946 would lead one of ordinary skill in the art to a lack of reasonable expectation of success for the embodiments of devices and fabrication methods of the instant application.

Further distinction in the devices can be understood through comparing the methods for fabrication of the device of '946 versus the methods of fabrication of the embodiments of devices of the instant application.

Regarding '946, in the teaching of Fig. 5 (Col. 22, line 44 to Col. 24 line 19), little explanation of the details of the device of Fig. 5 are given, but reference is given to US 5,977,556 (hereafter '566), which is essential material incorporated by reference, for the teaching of the basic design and fabrication of light-emitting devices of Fig. 5 As those of ordinary skill in the art are aware, the light-emitting diode (LED) devices of '566 are typified by Fig. 2(a) of '566, which is a small gallium-based LED device. (see Col. 6, line 30, through Col. 9, line 61). The small LED devices, such as that of Fig. 2(a) of '566, are fabricated using known semiconductor fabrication methods. That the device is a small-scale LED is clearly understood by reference to the capacitor, Cex, of Fig. 2(a) (Col 7, lines 42-45; underline added for emphasis):

> "In the view of specific mounting technique (sic) or the cost of an LED, an overlapped area of the electrode wiring **108** on the bottom of the step, namely the area of the capacitor Cex, may be about 100 μm^2."

The electrode wiring **108** as drawn in Fig. 2(a) is shown to have an area of about ten percent of the total area. Even in consideration of a device of 1000 μm^2, by comparison then, the total area of the LED devices of '566 are still quite small, particularly in comparison embodiments of the large area light-emitting devices of the instant application. As one of ordinary skill in the art is aware, high-volume semiconductor fabrication methods, such as photolithography, sputtering, chemical vapor deposition, electron beam deposition, and reactive ion etching, which are taught by '566 (see Col. 8, line 63, through Col. 9, line 49) are suitable for processing such small devices, but such

fabrication methods are not well matched to the large area deposition of colloids. Therefore, there is no teaching or suggestion in either '946, or '566 for suitable fabrication methods for embodiments of the instant application; e.g. for large area devices using colloidal Group IV nanostructures between about 0.5 nm to 100 nm, which are new materials with unique properties (see instant application; paragraphs 67-72).

As such, neither '946 nor '566 overcome the deficiency of '677 for providing teaching or suggestion of embodiments of the devices and fabrication methods of the instant application. Moreover, '677, '946, and '566, either individually or in combination, would not lead one of ordinary skill in the art to arrive at a reasonable expectation of success for embodiments of the large-area light emitting devices of the instant application, which uses novel colloidal Group IV nanostructures

Claims 18, 35, 37, and 39 were rejected in the Office Action under 35 USC 103(a) as being unpatentable over '677 in view of '946 and in further view of Forrest; US 2004/0031966 (hereafter '966). In making the rejection, the Examiner asserted that neither '677 not '946 teach a reflective layer, but such teaching is found in '966, rending the combination of references for embodiments of devices of the instant application having a reflective layer obvious thereby.

Reference is given to Fig. 1 of '966, which is an OLED device somewhat similar to that of the OLED device of '677, but having a reflective layer **160**. As such, '966 suffers from the same deficiencies as '677. In that regard, '966 does not overcome the deficiencies of '677 or '946, and the references either individually or in combination lack the teaching or suggestion of embodiments of devices and fabrication methods of the instant application.

Accordingly, no cited reference, or essential material incorporated by a cited reference therein, individually or in combination teach or suggest what is claimed in the instant application. Additionally, no cited reference establishes a reasonable expectation of success for embodiments of devices and fabrication methods of the instant application. Therefore, no *prima facie* case of obviousness has been established.

Given what is presented in the above, the Applicant respectfully requests the withdrawal of the rejection of the claims under 35 U.S.C. § 103(a) and allowance of the application, since no *prima facie* case of obviousness has been established.

CONCLUSION

The Applicant submits that all of the claims are in condition for allowance, which action is requested. If the Examiner finds that a telephone conference would expedite the prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided below.

Respectfully submitted,

Date: Oct. 25, 2006

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